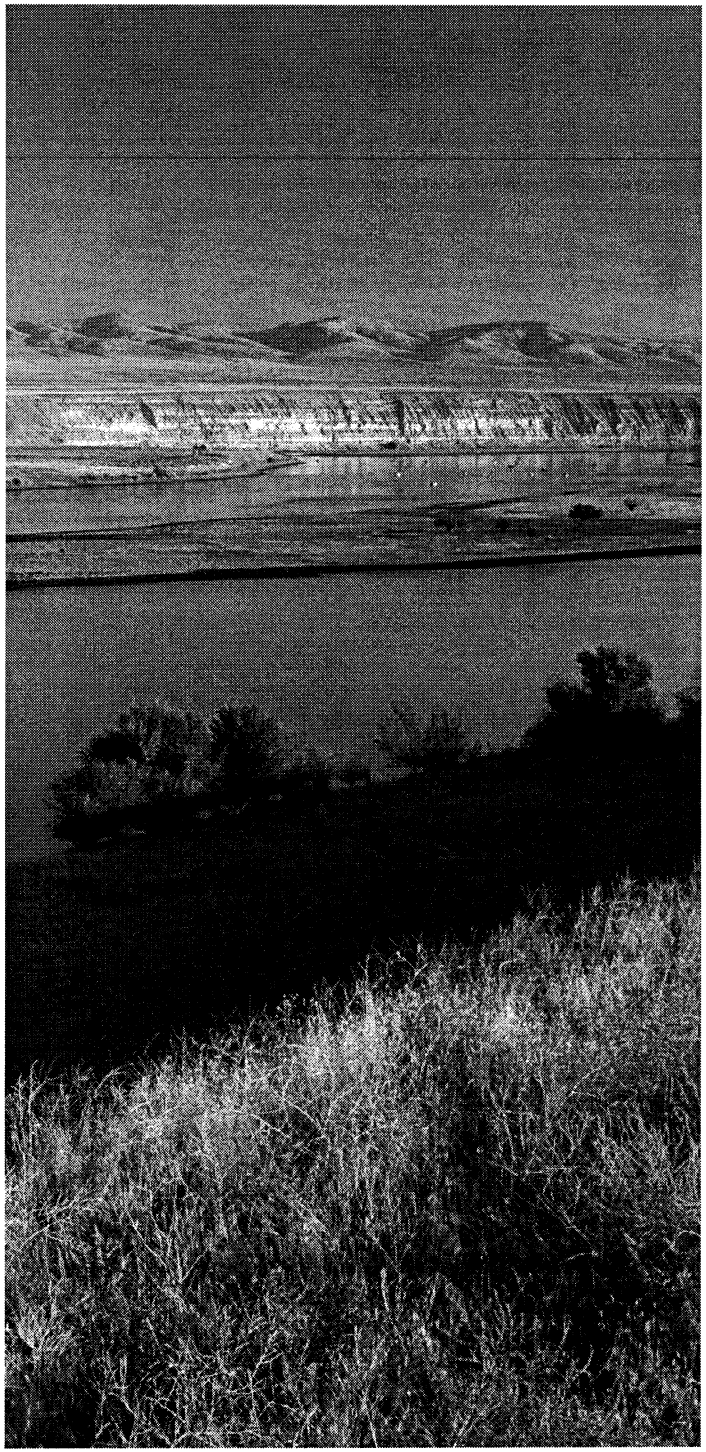
24th Nuclear Air Cleaning & Treatment Conference

September 2002



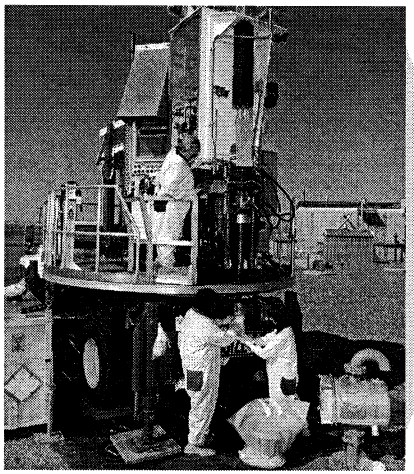
Bechtel National Inc.
Waste Treatment Plant Project

Ron Naventi
Project Manager

Presented to
27th Nuclear Air Cleaning & Treatment Conference
September 2002

Bechtel National, Inc.

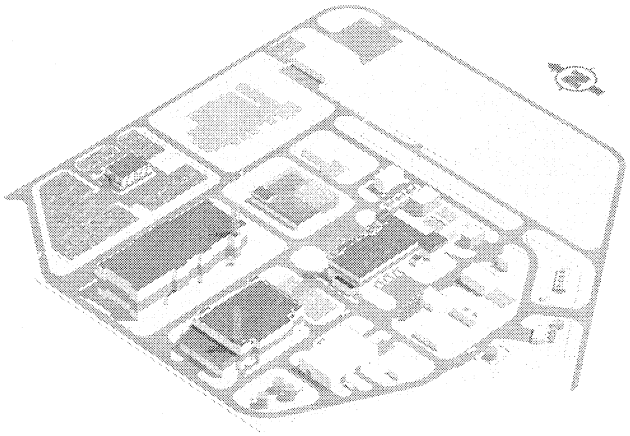
Tank Waste Management



- Operate and maintain tank farms
- Retrieve waste
- Deliver waste feed

CH2M Hill Hanford Group

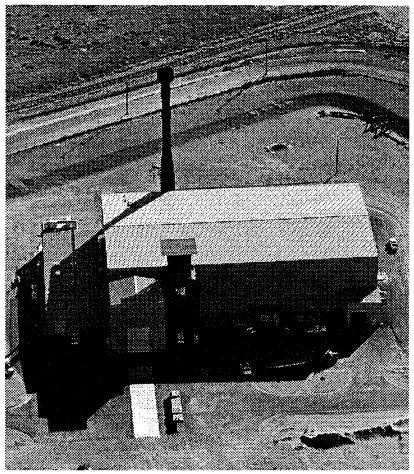
Vitrification



- Pretreat waste
- Process high-level waste to glass
- Process low-activity waste to glass

Bechtel National, Inc.

Storage/ Disposal



- Dispose of immobilized low-activity waste
- Store immobilized high-level waste

CH2M Hill Hanford Group

DOE

Plans, integrates, and manages

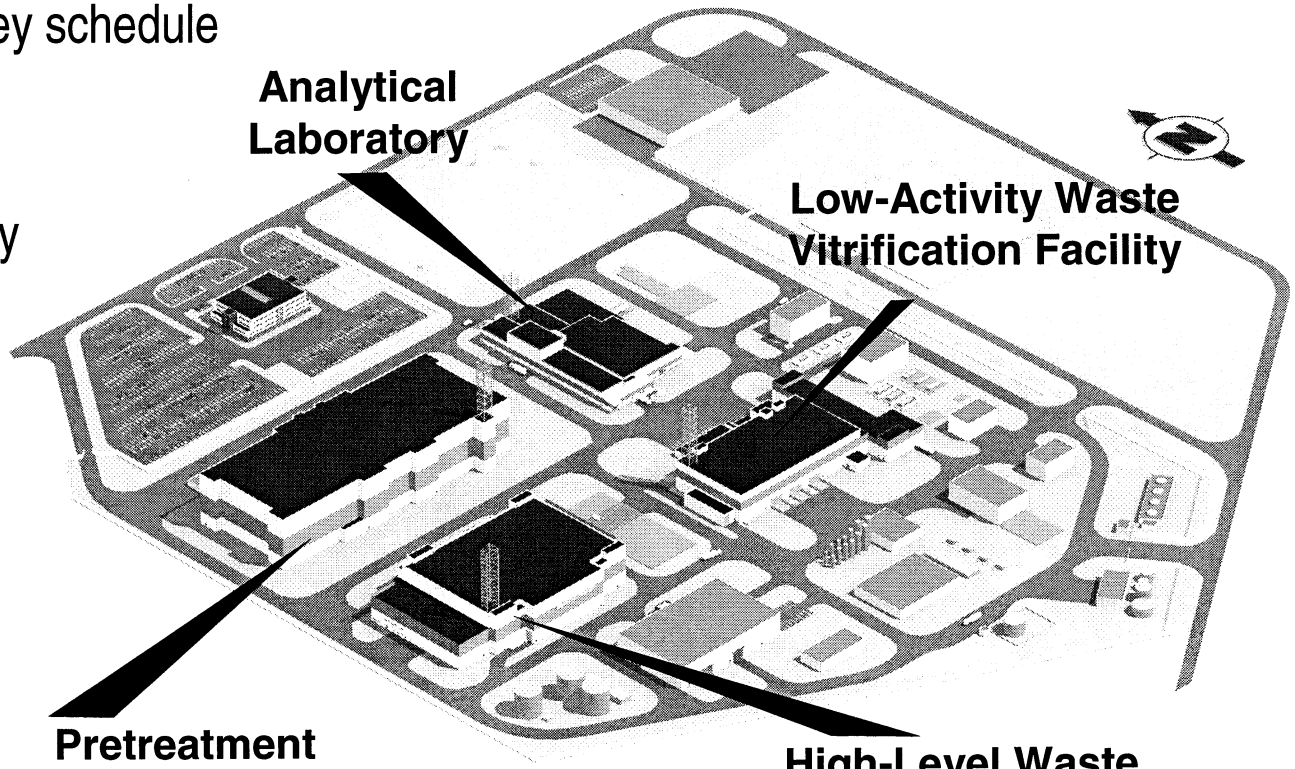
6-13-2002

- Garth Duncan, Bechtel National, Inc.
  - Deputy Engineering Manager for Waste Treatment Plant Project
  - 30 Years experience with Engineering, Procurement, Construction and Commissioning projects

- Cliff Winkler, Washington Group International
  - Melter Technology Manager for Waste Treatment Plant Project
  - 17 Years experience with diverse clean-up technologies; 22 years nuclear experience

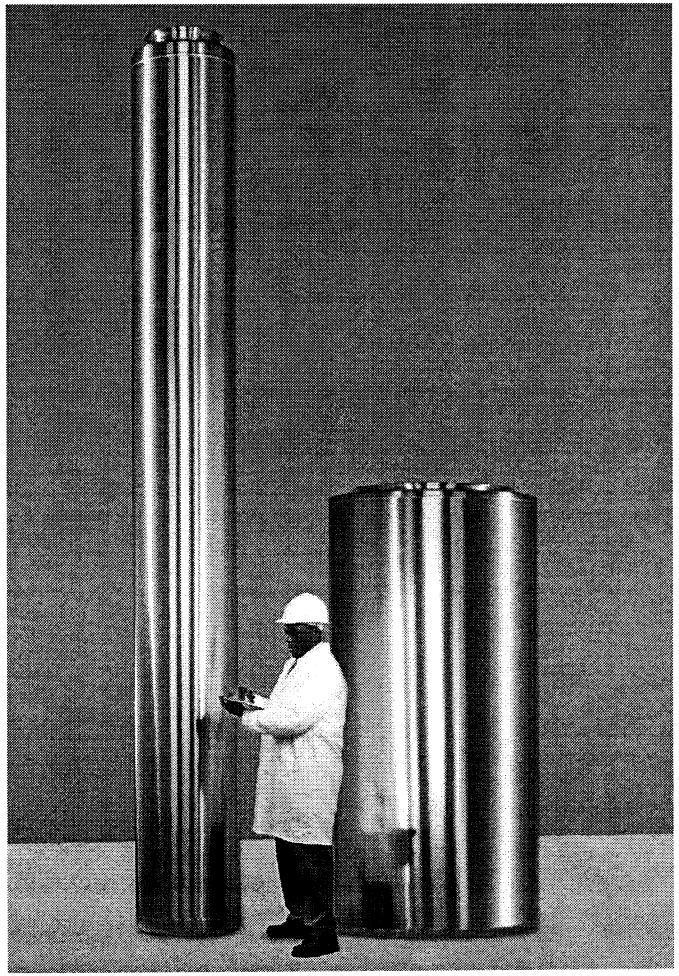
- Waste Treatment Plant Project
- Plant Vitrification Technology
- HVAC Design

- WTP is one 10-year project -- 10-year work plan, no yearly work plans
- WTP is a capital funded turn-key project.
  - Scope: Research & technology, engineering, procure, construct, commission
  - DOE is the owner -- BNI is the design authority.
- WTP contract provides incentives and penalties tied to total cost, key schedule milestones and plant performance.
- R&T and operability integrated into project execution planning.

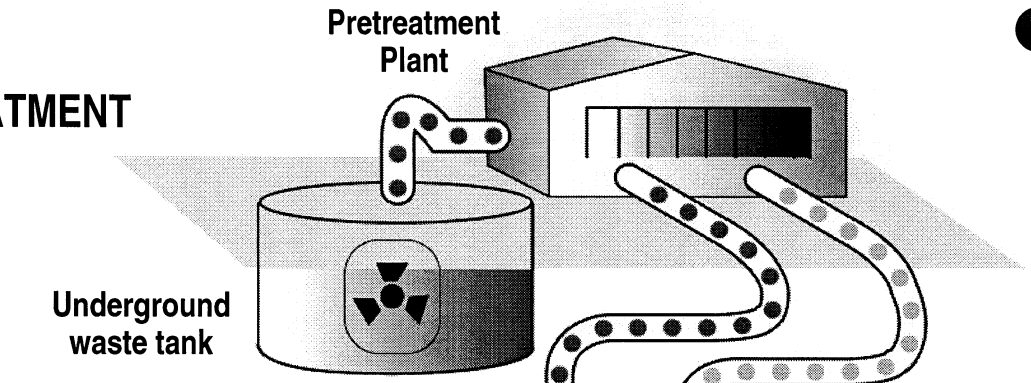


Our Mission:
Glass in 2007

- **High Level Waste Canisters**
  - 2' X 14.5'
  - 6,600 pounds of glass
  - 120 per year
  - Temporarily stored in Hanford's Canister Storage Building until national repository built
- **Low Activity Waste Canisters**
  - 4' X 7.5'
  - 13,000 pounds of glass
  - 1100 per year
  - Stored at Hanford's Central Plateau

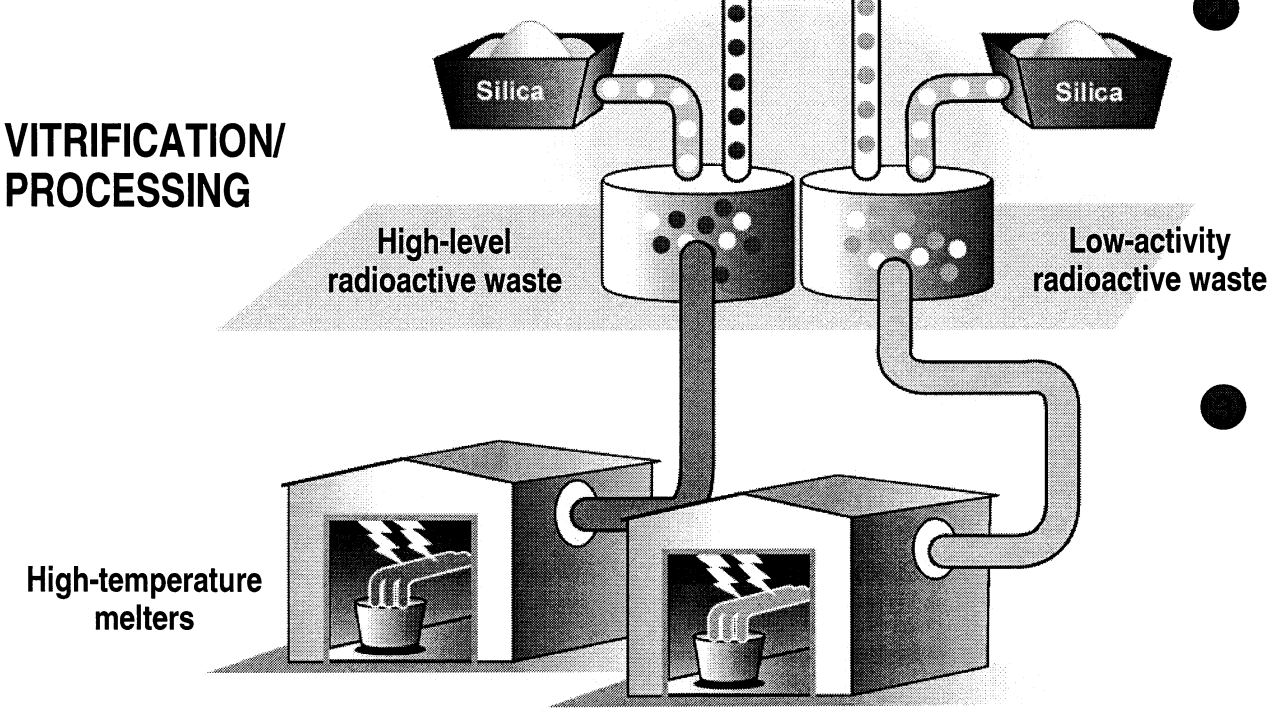


PRETREATMENT



- At a Hanford Site pretreatment plant, liquid waste is separated into two streams – high-level and low-activity radioactive waste.

VITRIFICATION/ PROCESSING



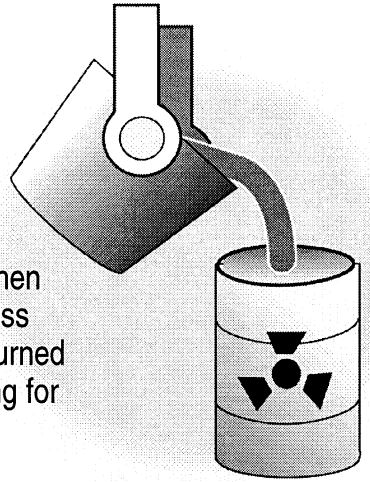
- Waste is prepared for the vitrification process by mixing it with silica and other glass-forming material to form a slurry mixture.

- The mixtures are fed into high-temperature melters where they are heated with electrical current for several days to form a molten glass.

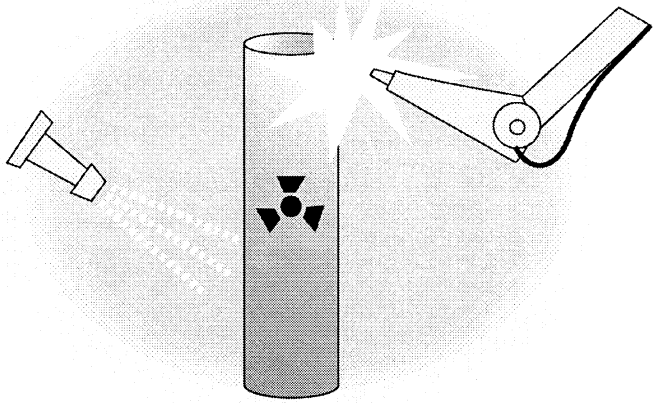
6-13-2002

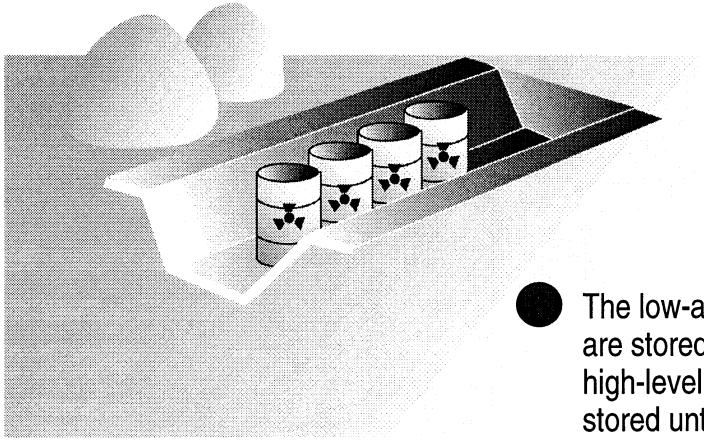
STORAGE/ DISPOSAL

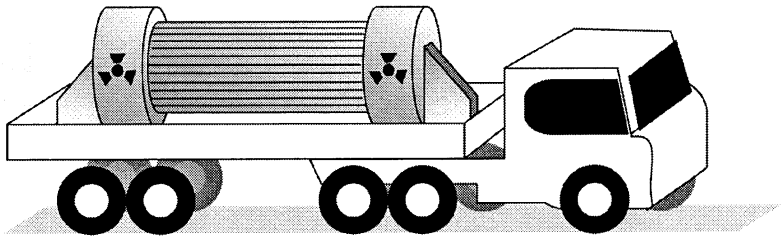
- The molten material is then poured into large stainless steel containers and returned to a solid state by cooling for several days.



- The containers are then welded shut and the exterior is decontaminated.







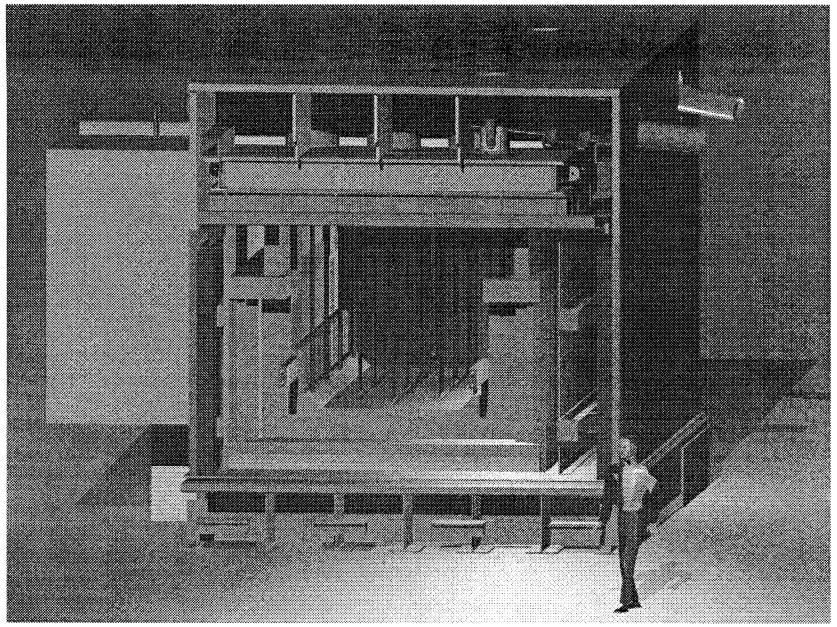
- The low-activity radioactive waste containers are stored in a cement-lined trench on site. The high-level radioactive waste containers are stored until shipped to a federal facility for permanent disposal.

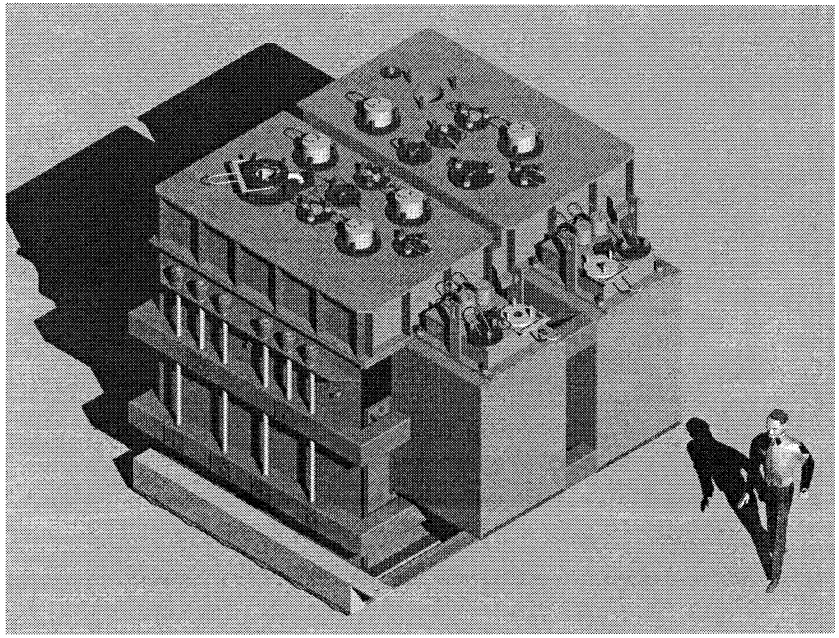
- July 10: First structural concrete placed
- Fall 2002: Full construction authorization for LAW and HLW
- Winter 2003: Full construction authorization for Pretreatment
- 2003:
  - **Major procurements for plant equipment**
  - **Complete Research and Technology testing for ultrafiltration and resin performance**
- 2004
  - Commission support facilities
    - water treatment plant
    - chiller plant
- 2007: Radioactive Glass "Hot commissioning"

- Broad engineering organization capable of design, construct, commission
- 1,200 Engineers on staff
- Design supports close-coupled execution

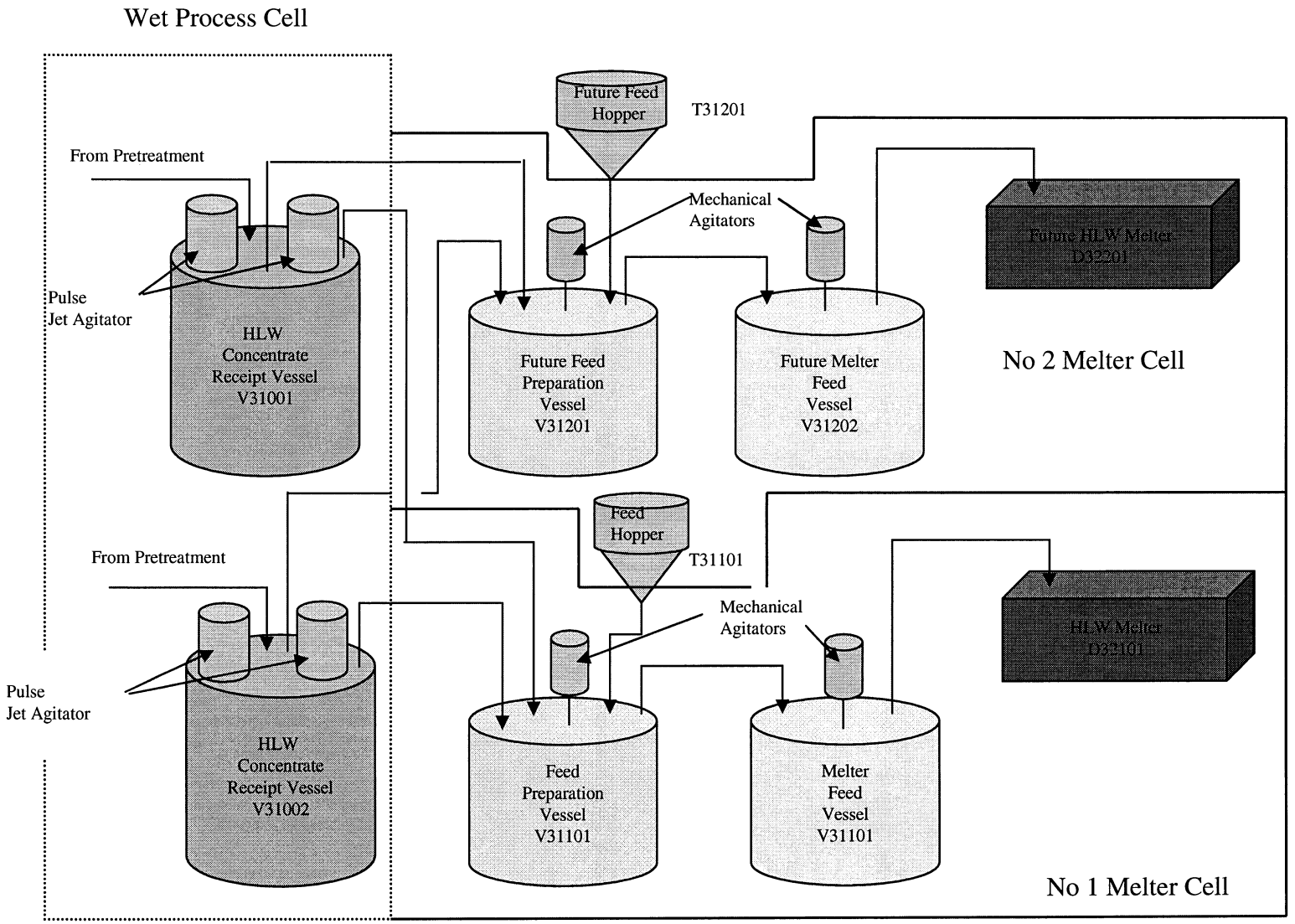
- Vitrification
  - history
  - WTP technology
  - process

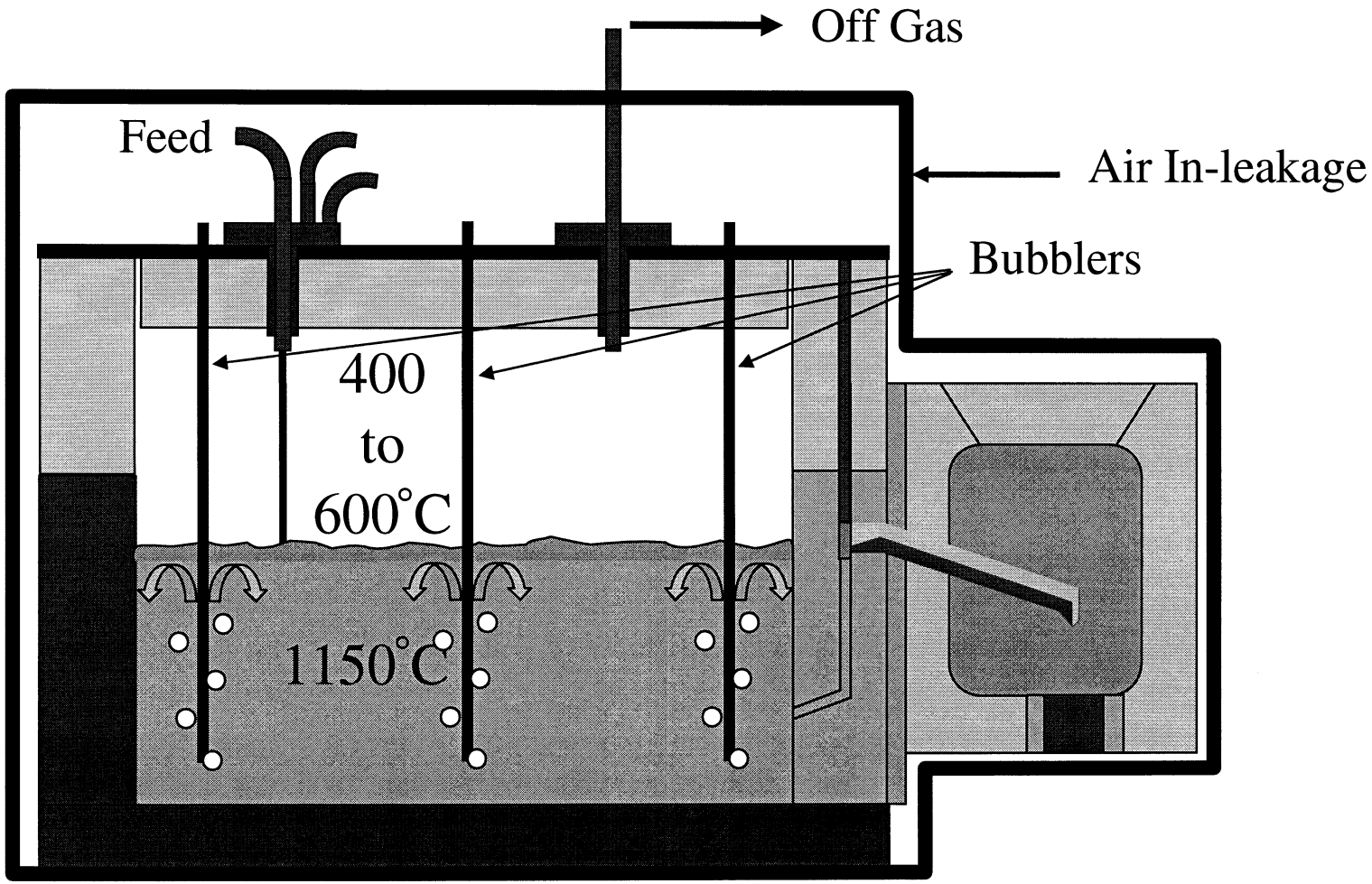
- LAW MELTER- 330 tons - 30 ft x 22 ft x 16 ft - 10 Sq M of glass surface - 15 MT/day.

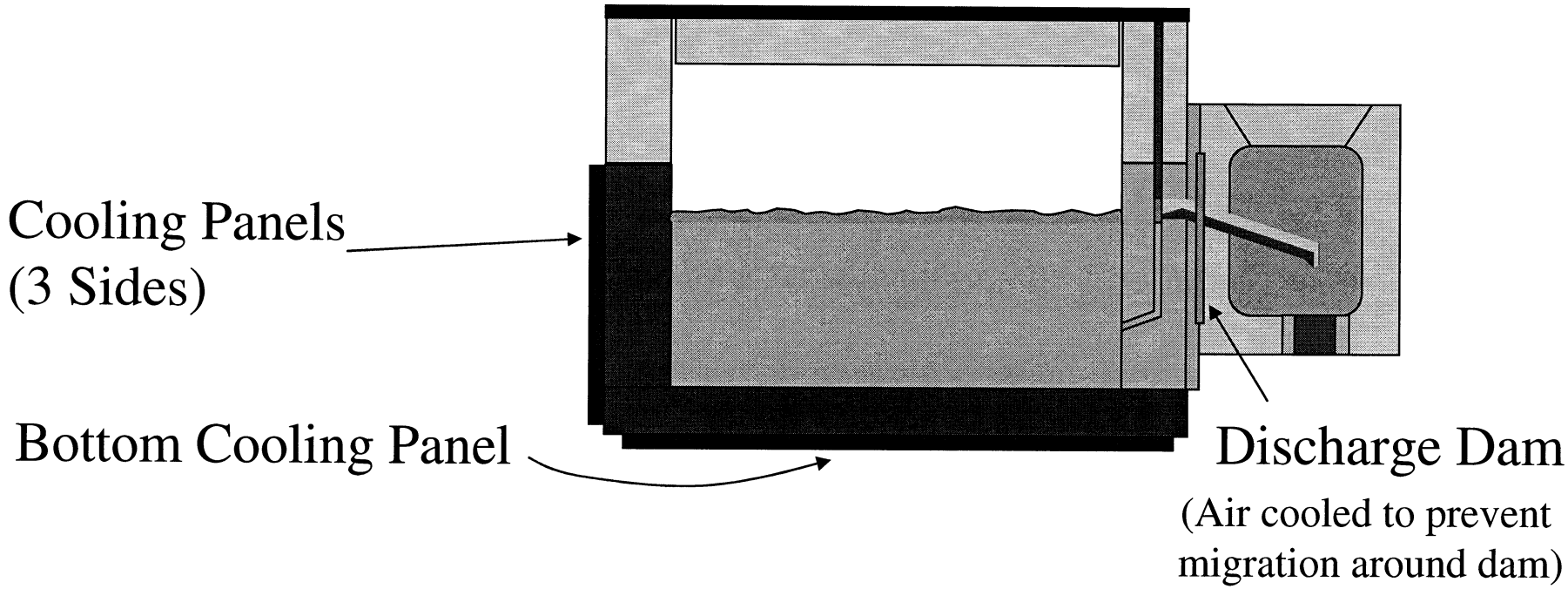


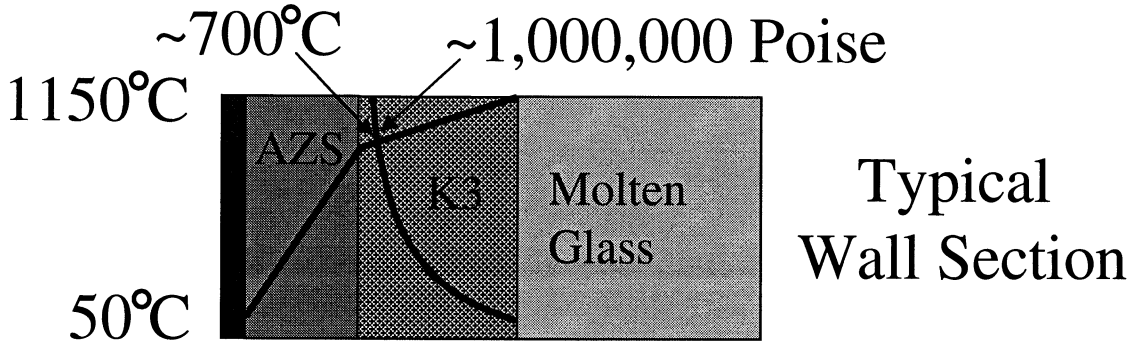


HLW MELTER- 100 tons - 14 ft x 15 ft x 12 ft -3.75 Sq M of glass surface - 1.5 to 3.0 MT/day.

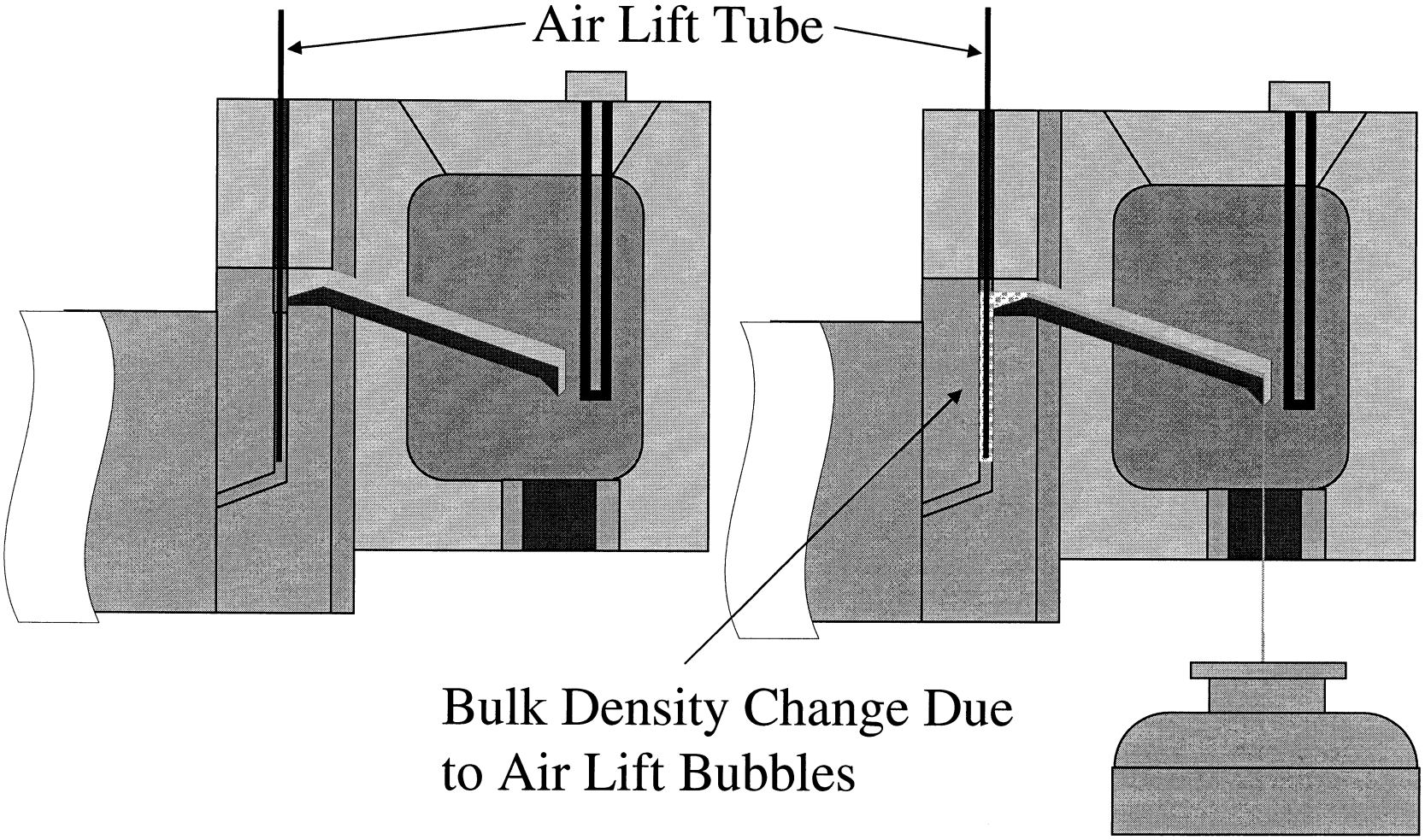

Wet Process Cell
Future Feed Hopper
T31201
From Pretreatment
Mechanical Agitators
Future HLW Melter D32201
Pulse Jet Agitator
HLW Concentrate Receipt Vessel V31001
Future Feed Preparation Vessel V31201
Future Melter Feed Vessel V31202
No 2 Melter Cell
Feed Hopper
T31101
From Pretreatment
Mechanical Agitators
HLW Melter D32101
Pulse Jet Agitator
HLW Concentrate Receipt Vessel V31002
Feed Preparation Vessel V31101
Melter Feed Vessel V31101
No 1 Melter Cell

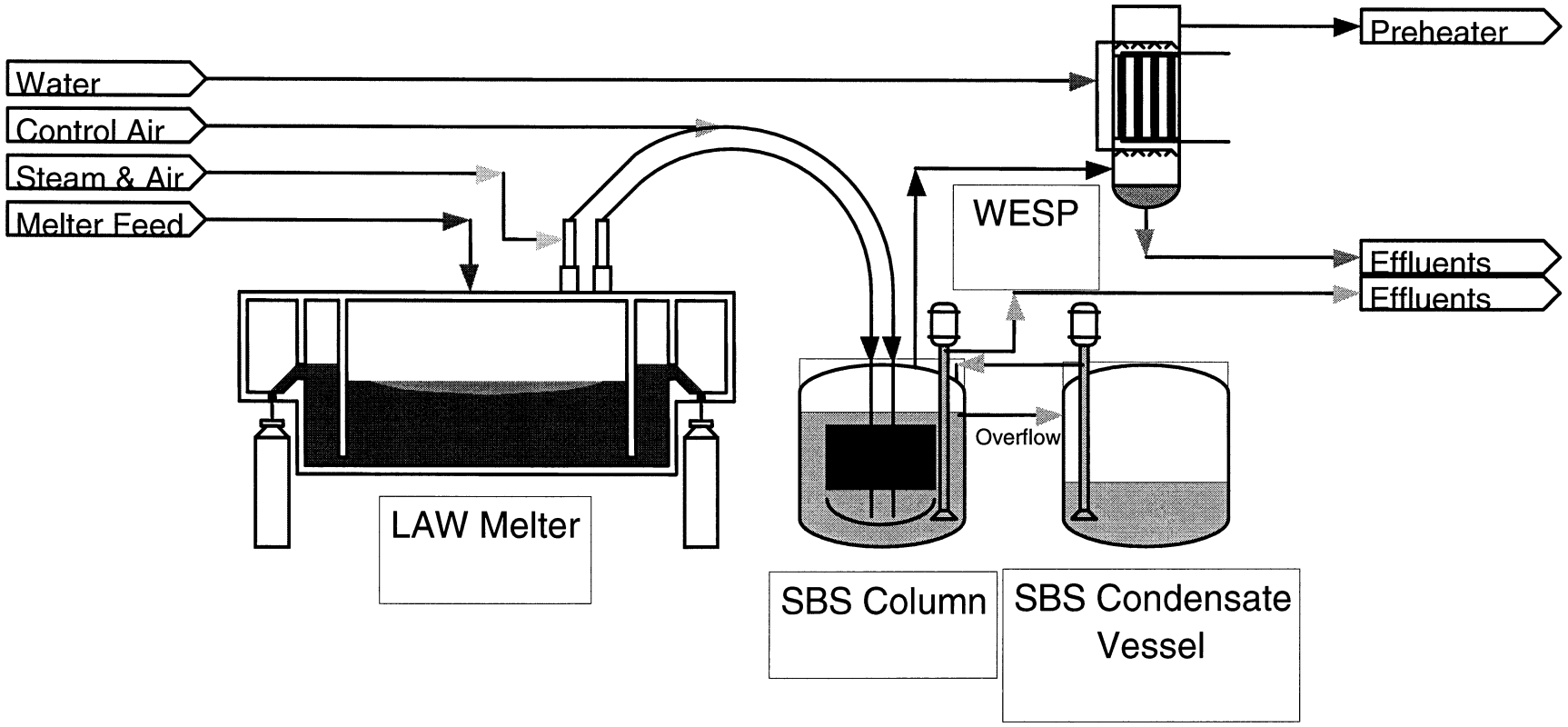

Off Gas
Feed
Air In-leakage
Bubblers
400
to
600°C
1150°C

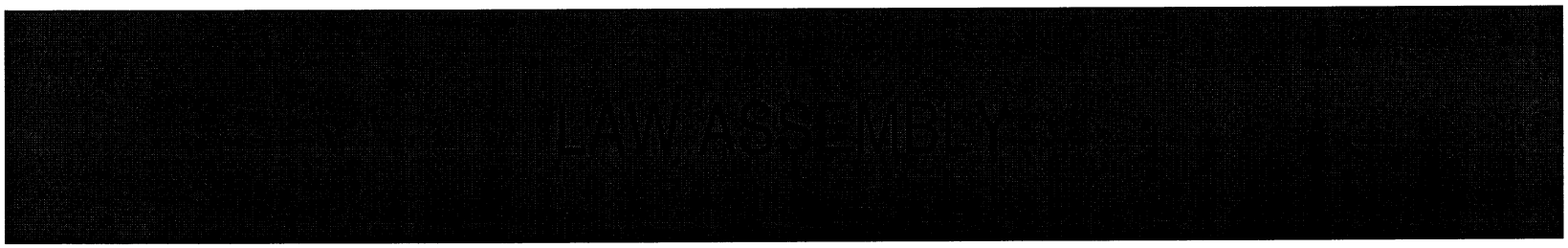




Typical
Wall Section


Air Lift Tube
Bulk Density Change Due
to Air Lift Bubbles

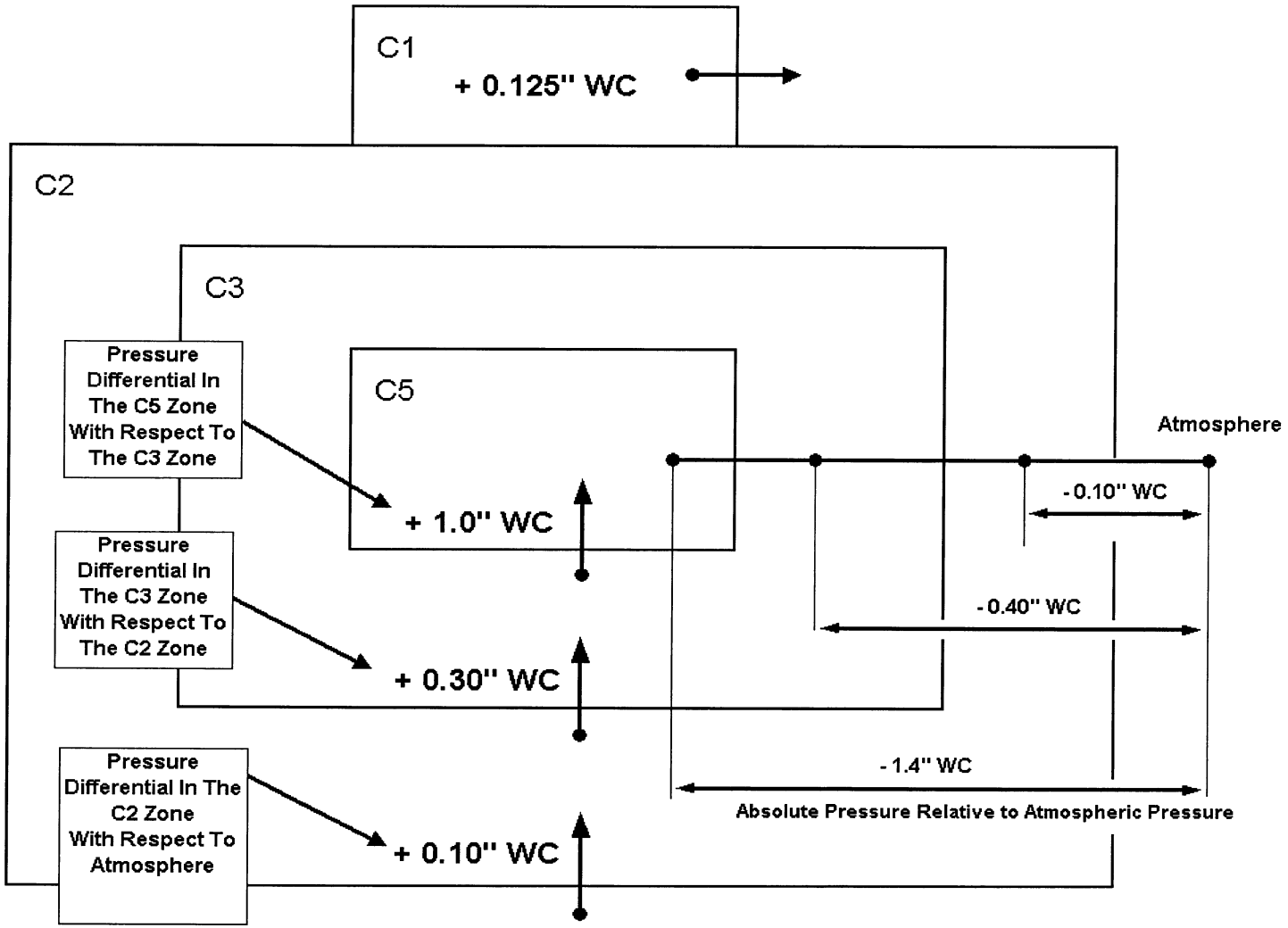

Water
Control Air
Steam & Air
Melter Feed
Preheater
WESP
Effluents
Effluents
Overflow
LAW Melter
SBS Column
SBS Condensate Vessel



Automation of LAW Melter Assembly

- HVAC Design Criteria
- Confinement Zones and Pressure Differentials
- HVAC System Capacities
- HEPA Filters and Housings

- ASME AG-1 Code on Nuclear Air and Gas Treatment
- ASME N509 Nuclear Power Plant Air-Cleaning Units and Components
- ASME N510 Testing of Nuclear Air Treatment Systems
- ASME NQA-1 Quality Assurance Program Requirements for Nuclear Facilities



Nominal Pressure Differential By Contamination Zone

Pretreatment Facility

- C2 Air Supply = 210,000 CFM
- C2 Exhaust = 82,000 CFM
- C3 Exhaust = 54,000 CFM
- C5 Exhaust = 63,000 CFM
- Vessel Vent Exhaust = 3,000 CFM
- Reverse Flow Diverter / Pulse Jet Mixer Exhaust = 37,000 CFM

HLW Vitrification Facility

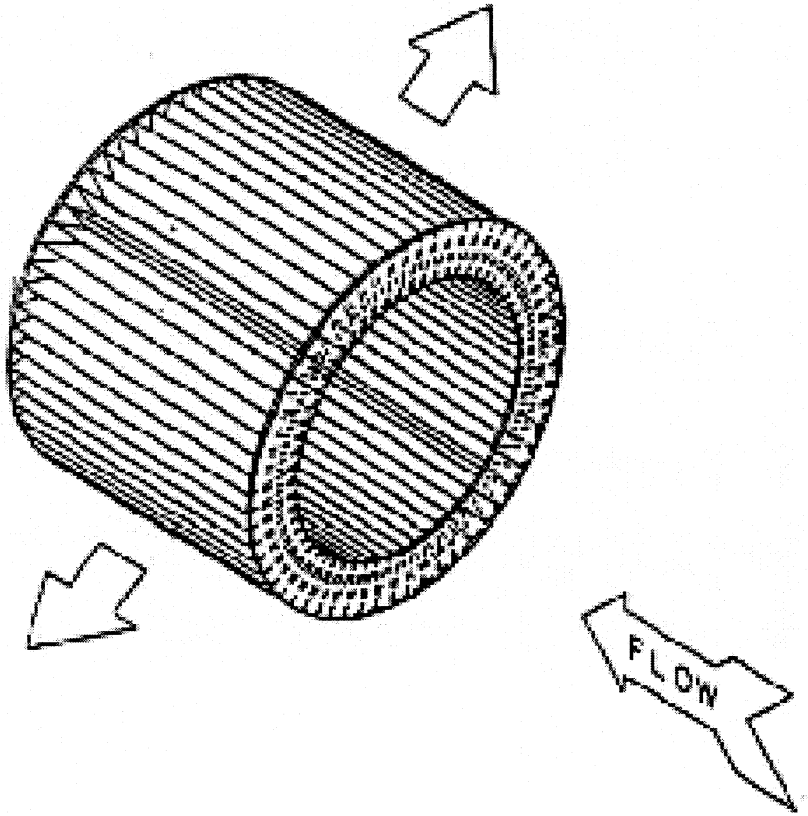
- C2 Air Supply = 162,000 CFM
- C2 Exhaust = 60,000 CFM
- C3 Exhaust = 55,000 CFM
- C5 Exhaust = 53,000 CFM
- Canister Storage C3 Exhaust = 11,400 CFM
- Canister Storage C3 Supply = 6,400 CFM

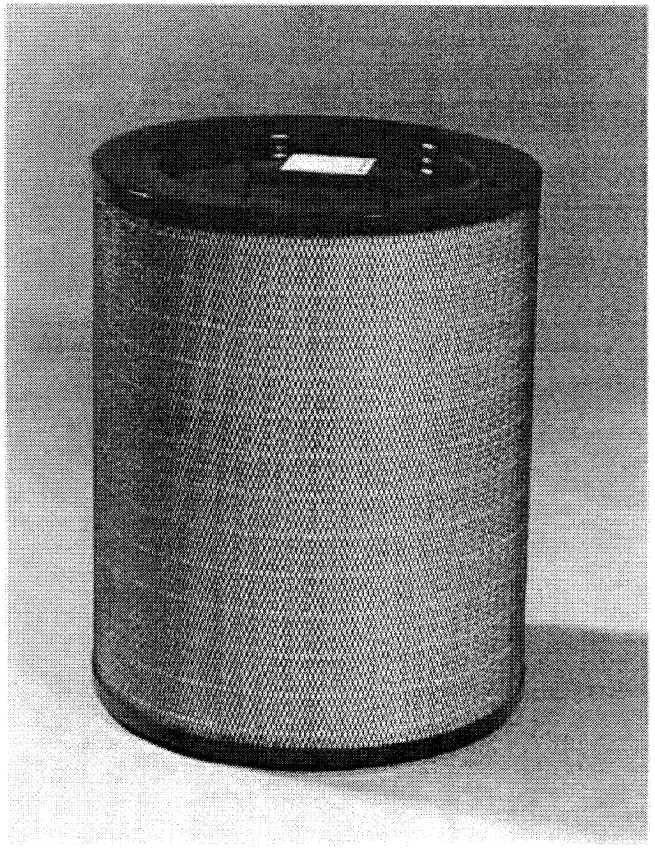
LAW Vitrification Facility

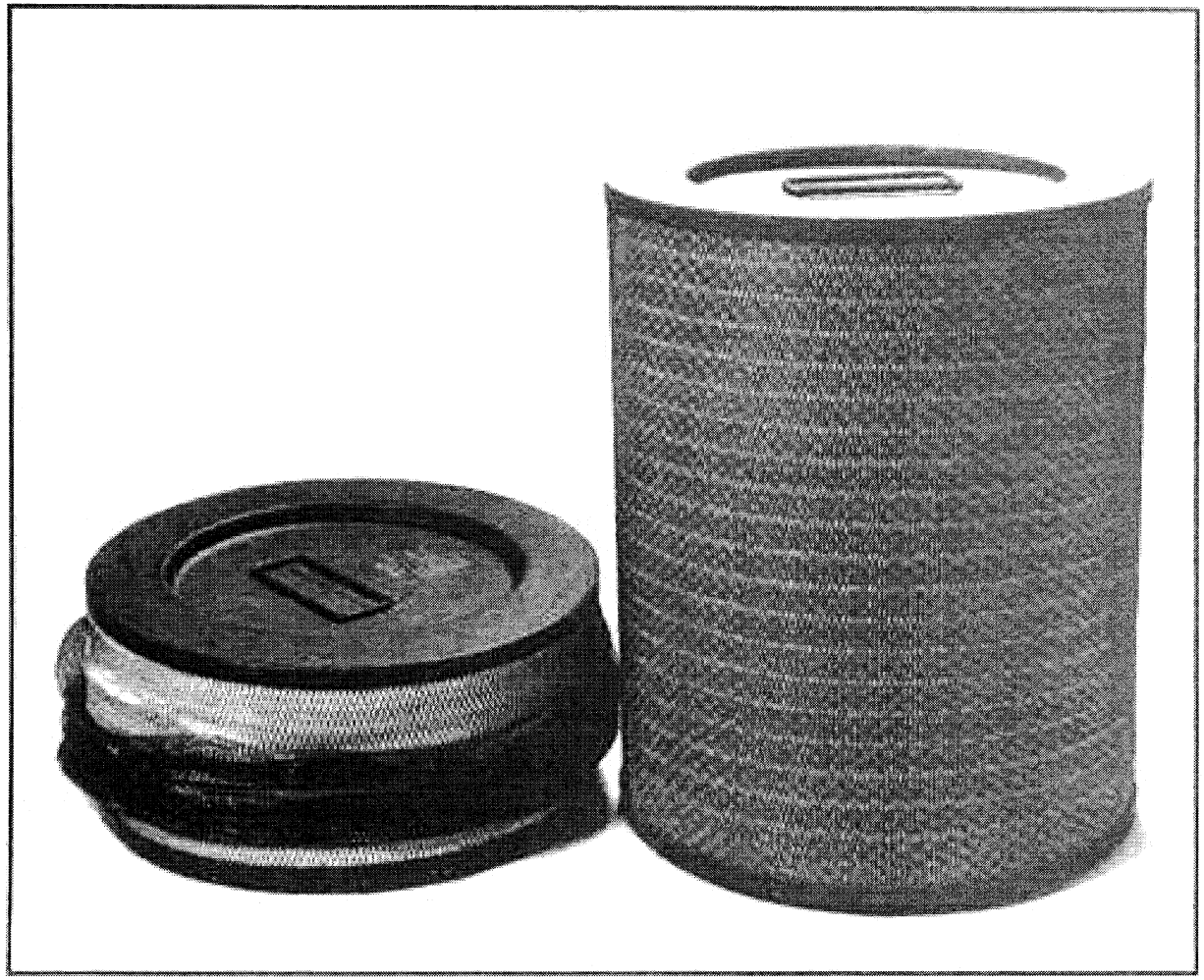
- C2 Air Supply = 115,000 CFM
- C2 Exhaust = 50,000 CFM
- C3 Exhaust = 45,000 CFM
- C5 Exhaust = 61,000 CFM
- Container Storage Exhaust = 42,000 CFM
- Container Storage Supply = 40,000 CFM

Analytical Laboratory

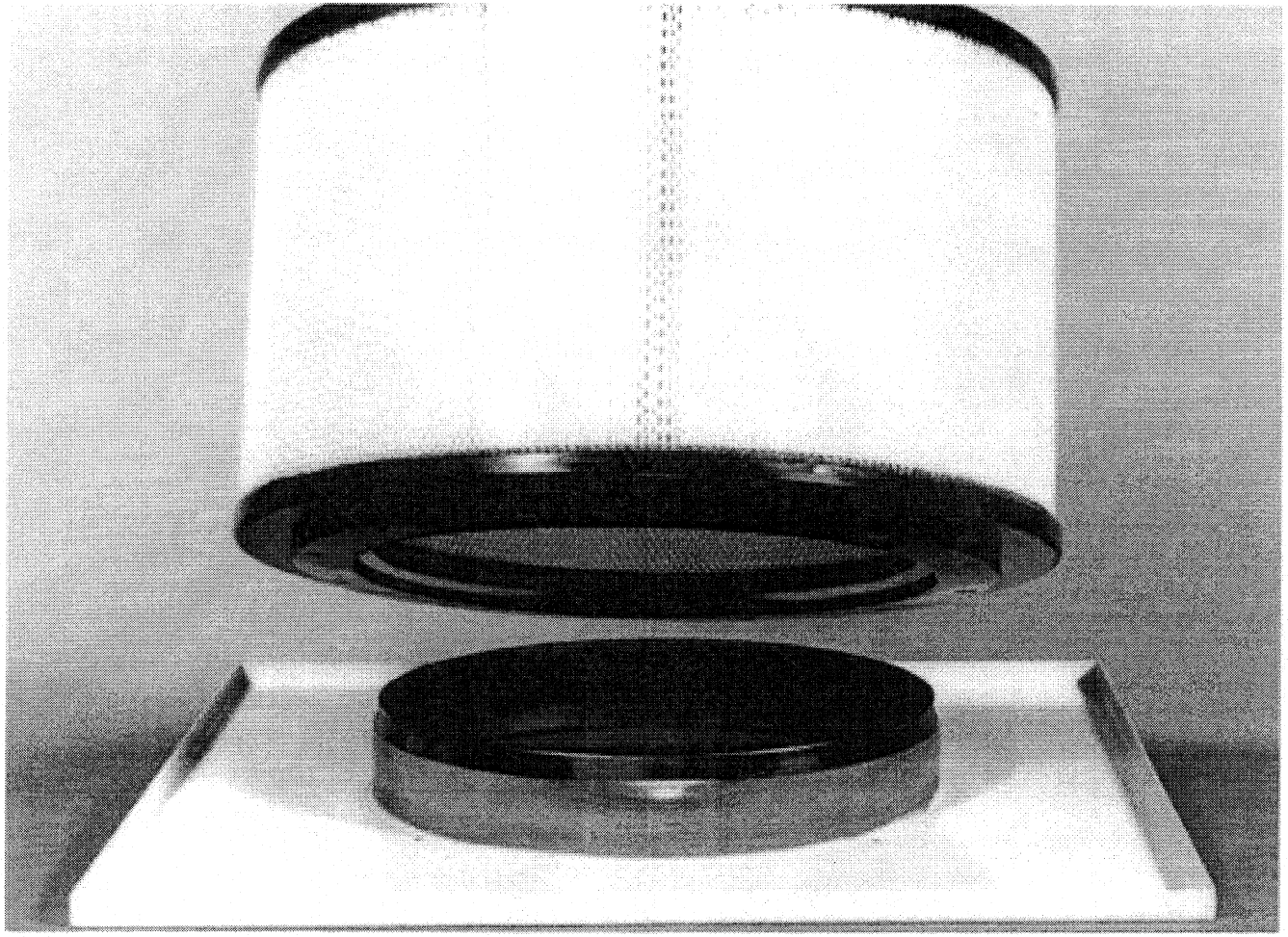
- C2 Air Supply = 124,000 CFM
- C2 Exhaust = 50,000 CFM
- C3 Exhaust = 82,000 CFM
- C5 Exhaust = 17,000 CFM


FLOW



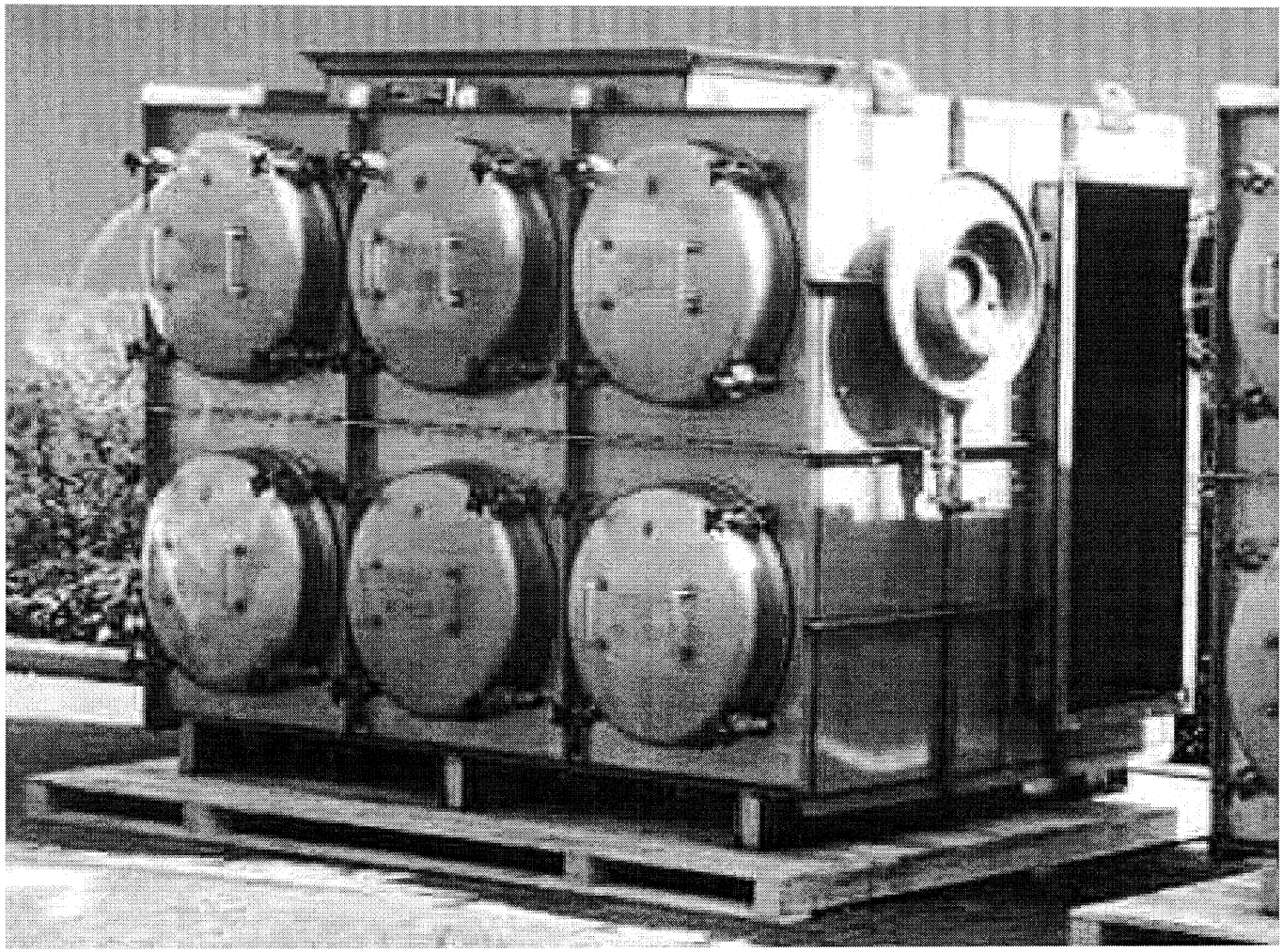


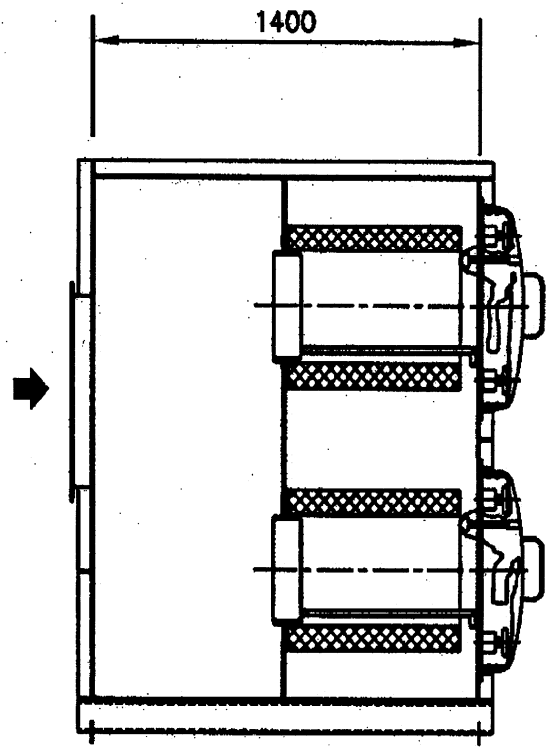
Compacted Radial Flow HEPA Filter



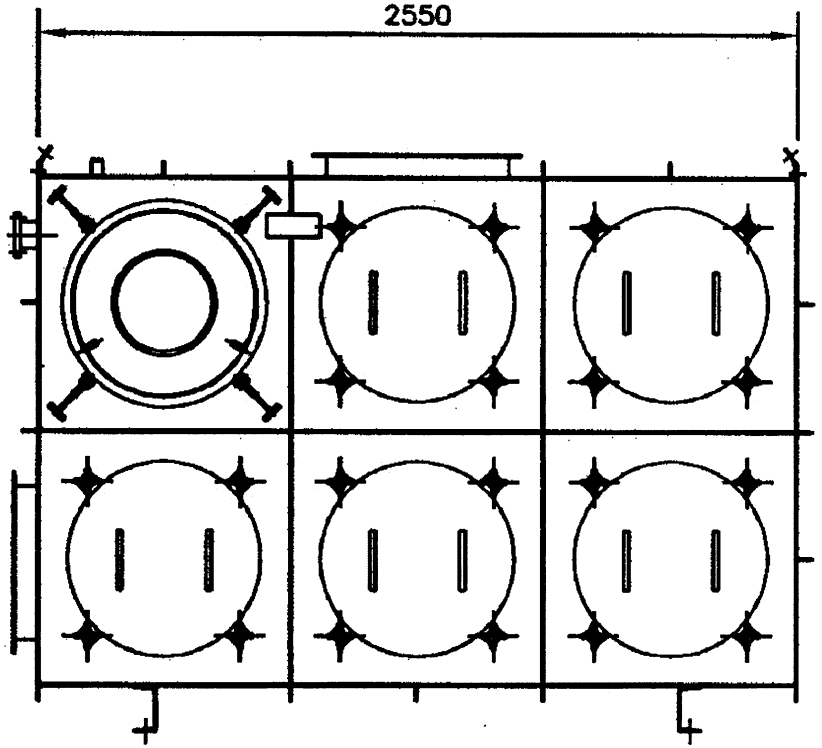
Safe Change HEPA Filter Seal

- Compact system -- lower building volume
- Sealing without clamping.
- Internal gaskets less likely to be damaged in normal handling.
- Improved filter positioning and orientation characteristics.
- Ease of reducing volume for disposal.
- Safer handling with no sharp edges.
- Confining the contaminant inside the annulus of the filter which minimizes the release of collected particles.
- This allows the filter to be plugged after use to limit the loss of collected material.

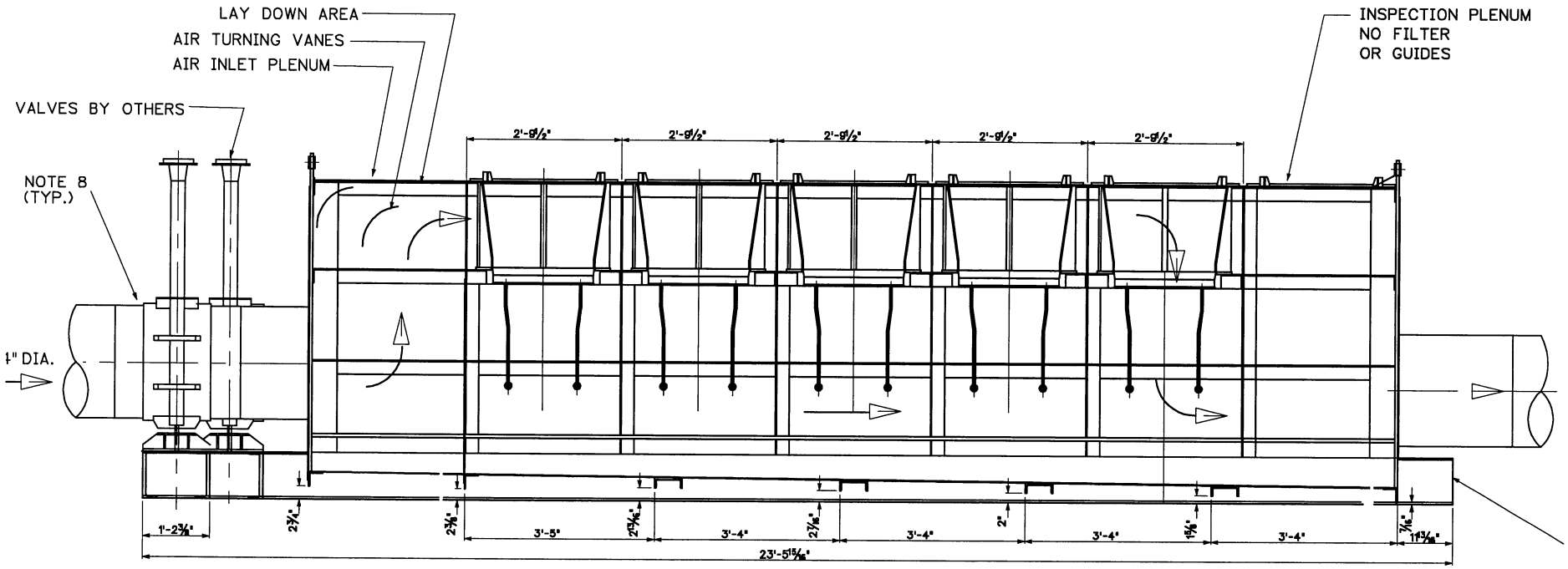




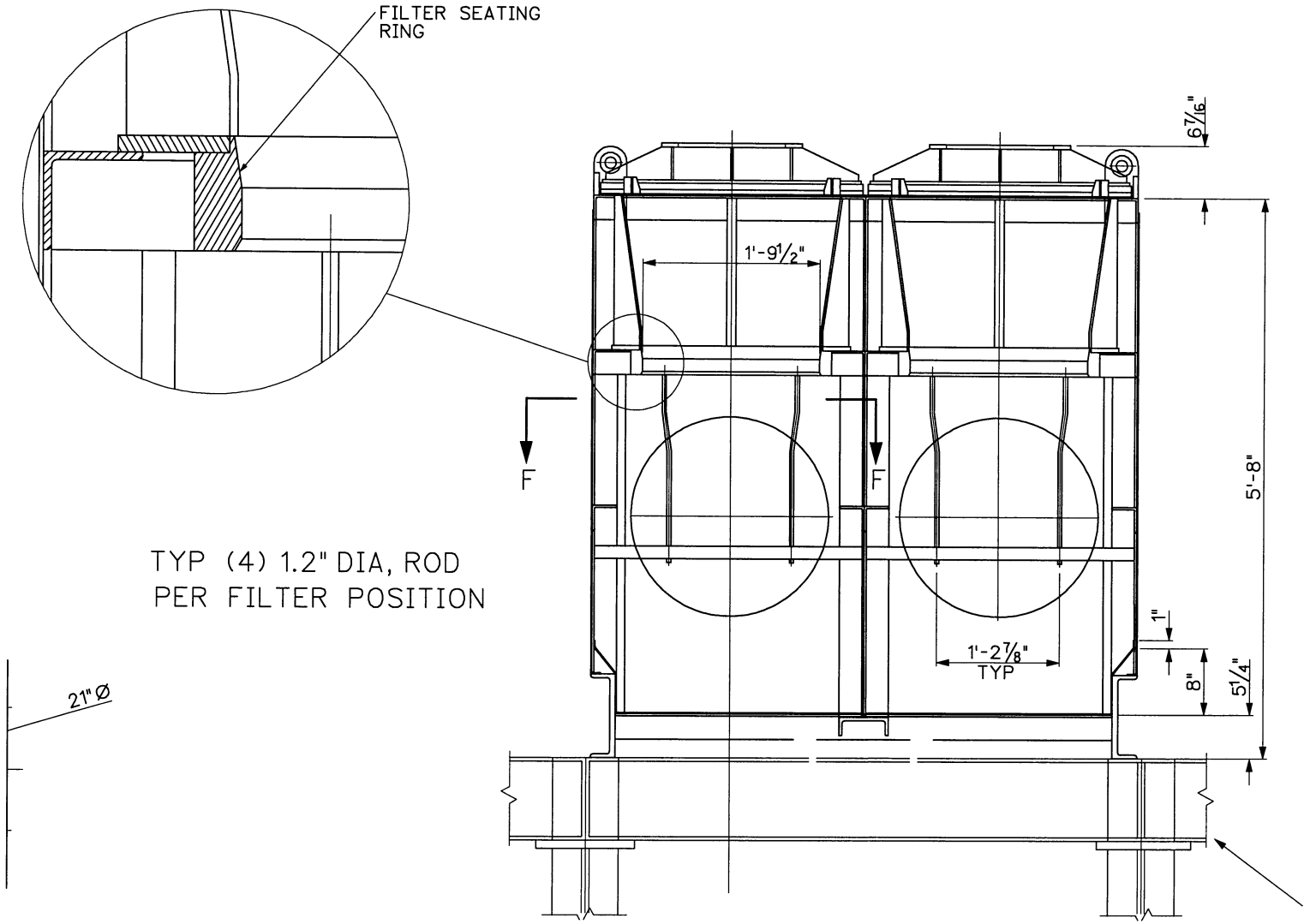
TYPICAL SECTIONAL ELEVATION



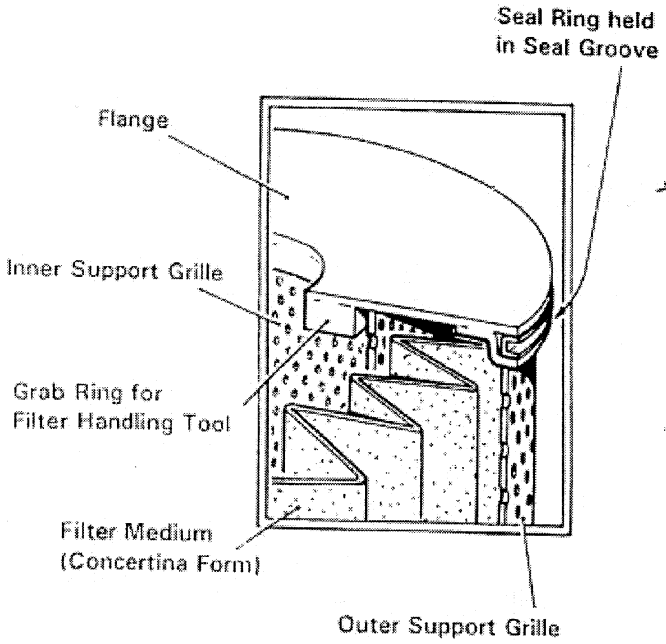
3 x 2 FILTER UNIT


LAY DOWN AREA
AIR TURNING VANES
AIR INLET PLENUM
VALVES BY OTHERS
NOTE 8
(TYP.)
INSPECTION PLENUM
NO FILTER
OR GUIDES
2'-9½"
2'-9½"
2'-9½"
2'-9½"
2'-9½"
1" DIA.
1'-2¾"
2¾"
2¾"
3'-5"
2⅞"
3'-4"
2⅞"
3'-4"
2"
3'-4"
1⅝"
3'-4"
¾"
1"
23'-5⅝"

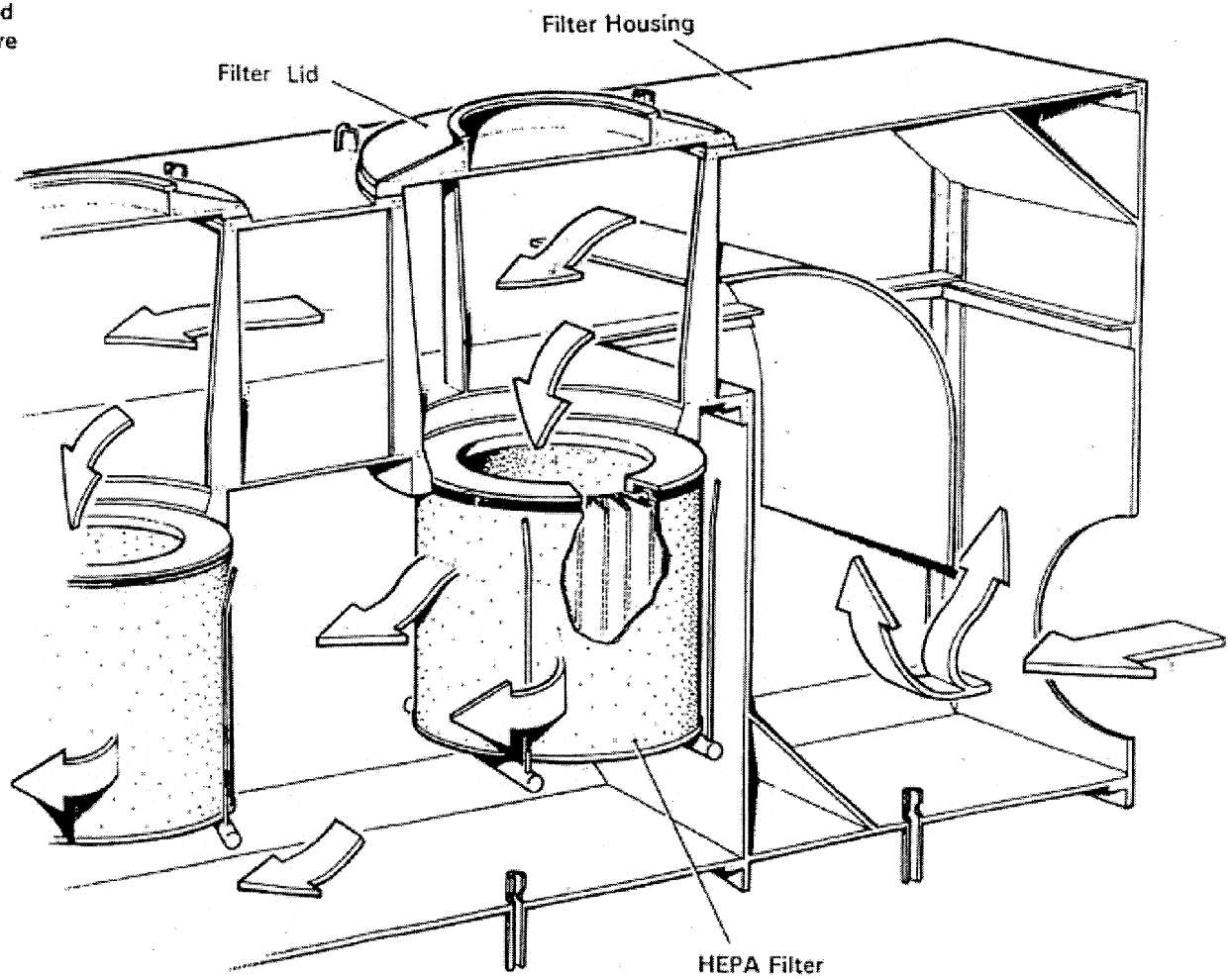
Side View


FILTER SEATING RING
6 7/16"
1'-9 1/2"
F
F
5'-8"
TYP (4) 1.2" DIA, ROD
PER FILTER POSITION
1"
1'-2 7/8"
TYP
8"
5 1/4"
21" Ø

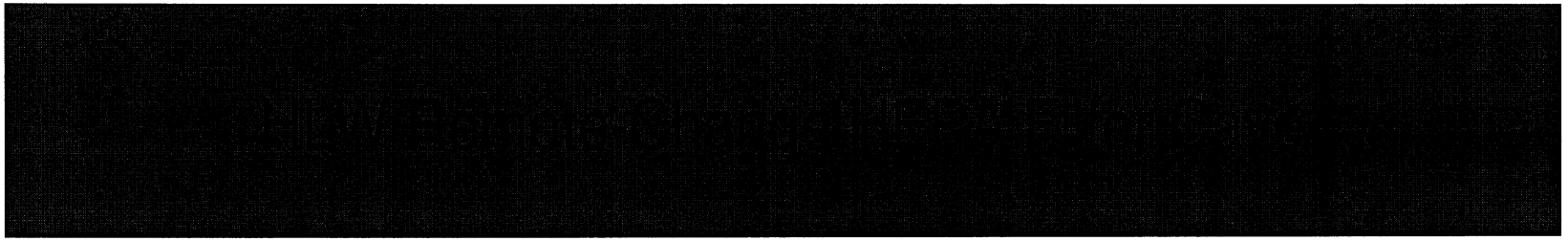
End View



CIRCULAR
HEPA FILTER
(Filter Cave)

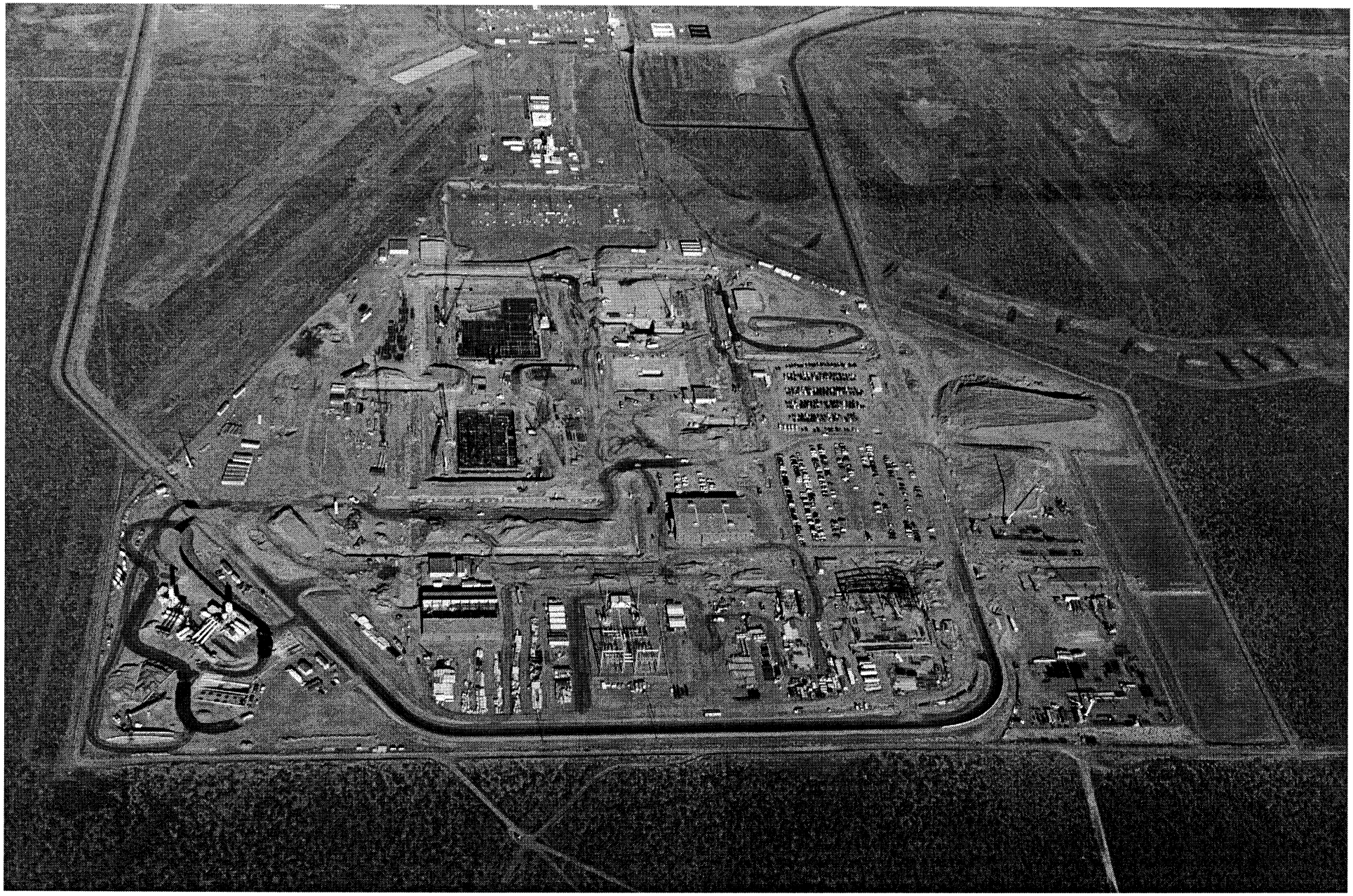


Section View



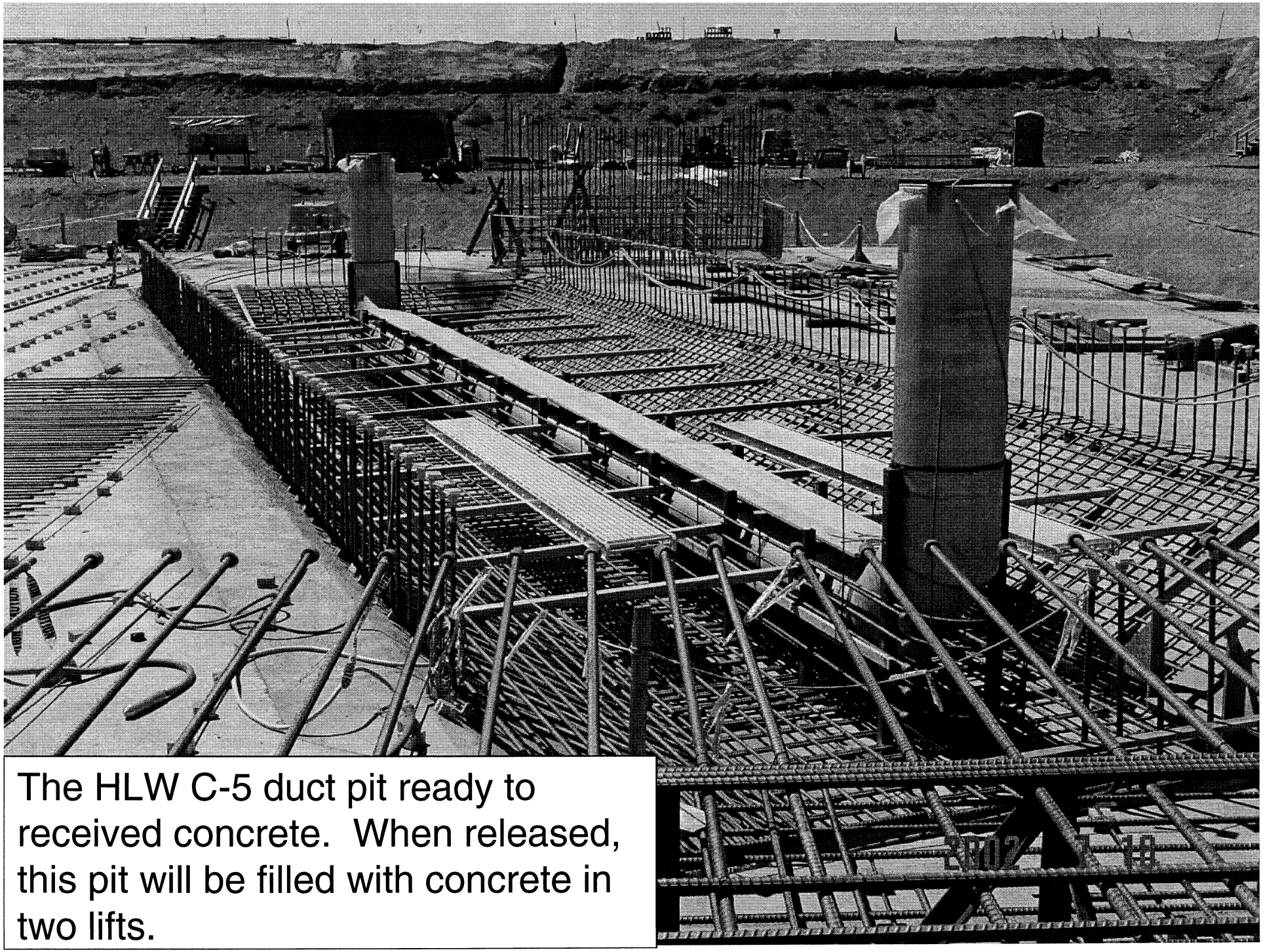
Automation of HLW HEPA Filter Change

WTP Construction Site -- January 2002

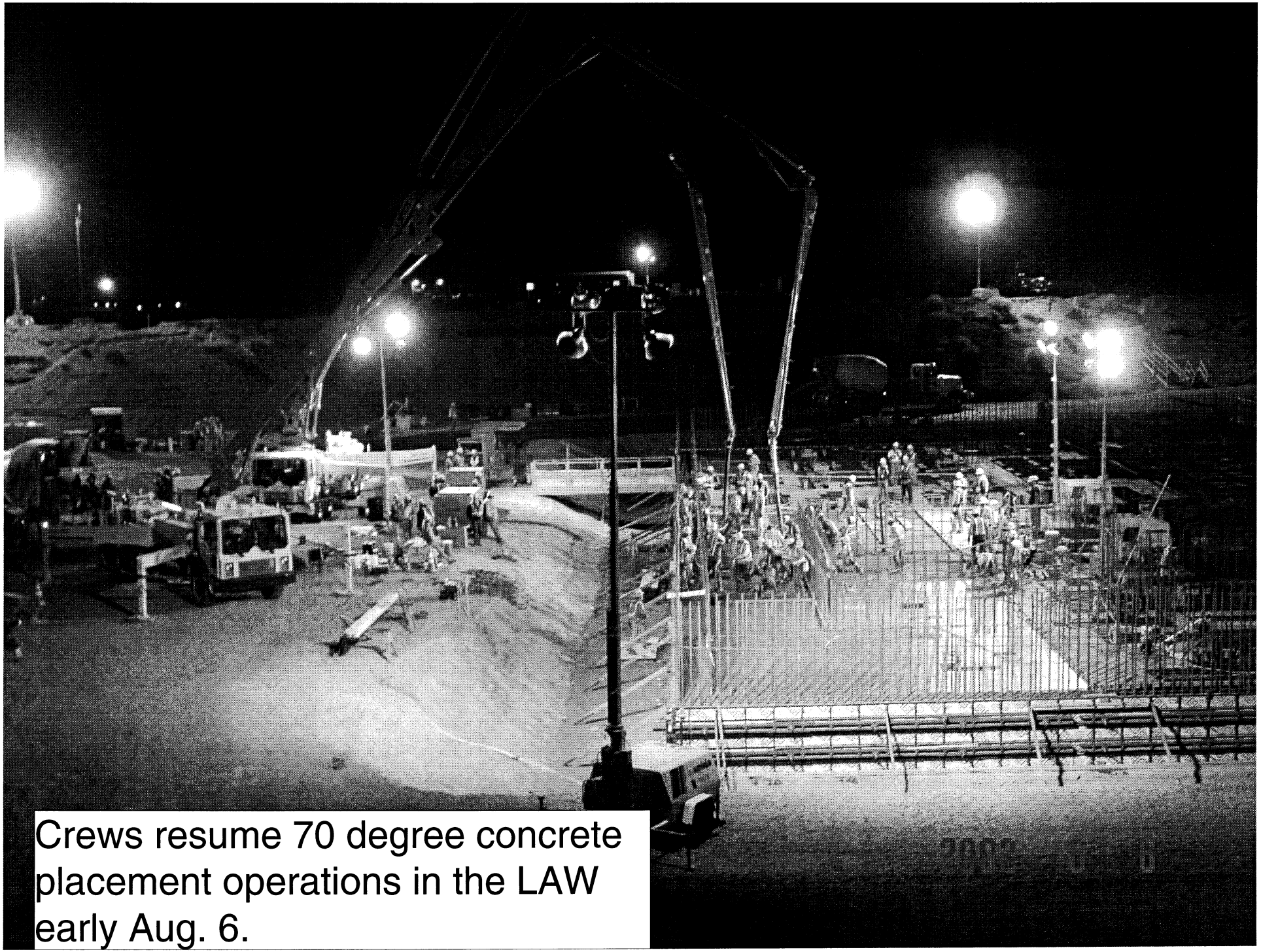


WTP Construction Site -- Today

LAW tower crane support assembly being set. Basemat rebar progress show on the right side.

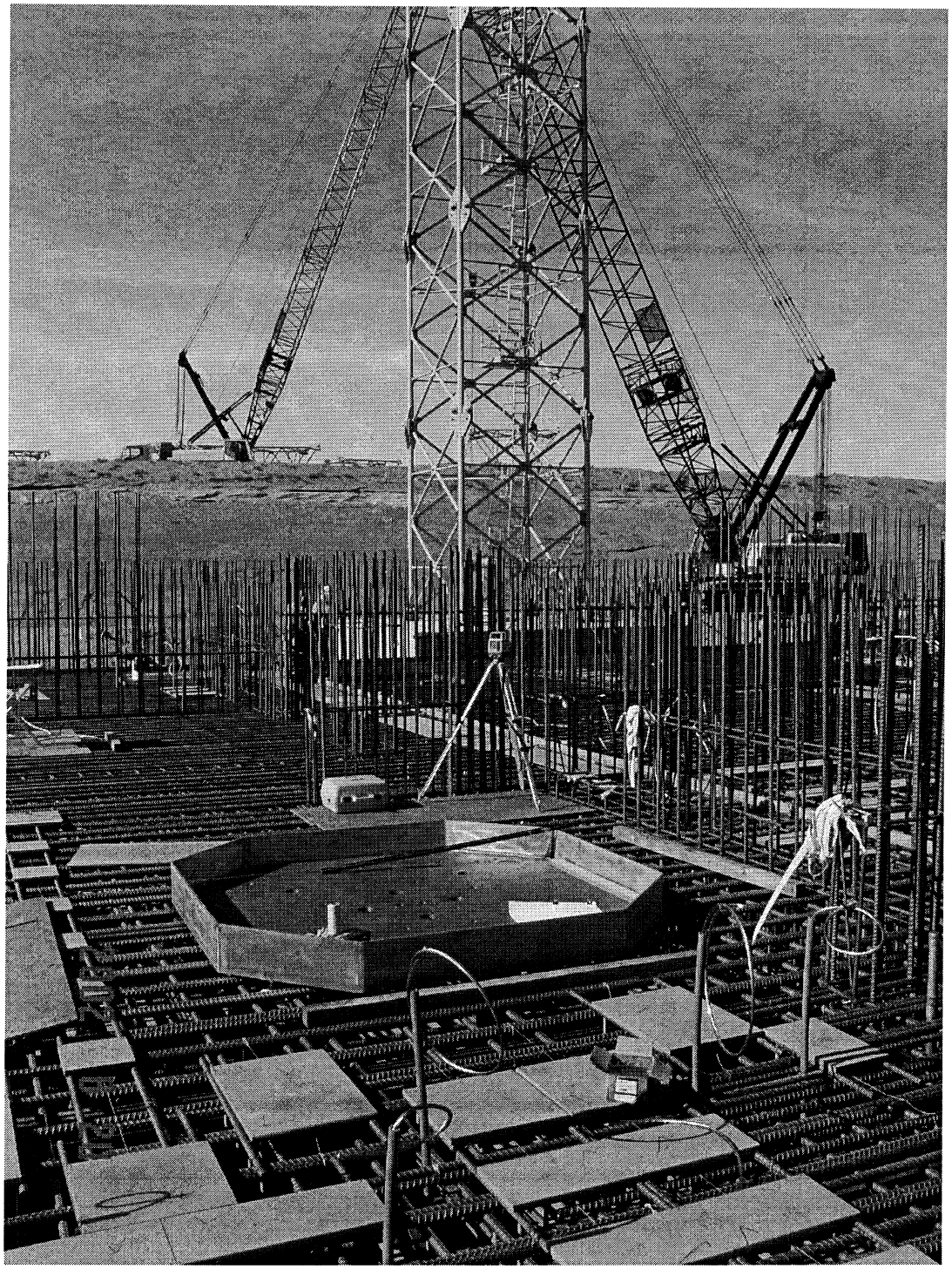


The HLW C-5 duct pit ready to received concrete. When released, this pit will be filled with concrete in two lifts.



Crews resume 70 degree concrete placement operations in the LAW early Aug. 6.

Laborers and Cement Masons make the second LAW concrete placement early Aug. 8



LAW basemat progress with interior wall rebar dowels and miscellaneous embedded metal. The special embed shown is the canister carousel embed.


Glass in 2007
Safety
Quality
Compliance
Skilled Work Force
Schedule
Technology
“Let’s get on with it”